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Application of certain Human Factors criteria to the actual aircraft maintenance engineers operational duties in aviation transport

To correlate Human Factors in the Aviation World / Industry, specifically within the technical area of Aircraft Maintenance. Maintenance planning responsibilities, including Human Factors in Aviation has been very well researched to date in most areas of aviation. It will specifically focus on three key areas of Human Factors, Social Psychology, Communication and Human Error.

An understanding of the importance of Human Factors to aircraft maintenance engineering is essential to anyone pursuing a career as a licensed aircraft engineer. This is because human factors will impinge on everything one does in the course of one's work, in one way or another. The focus of this article will examine the relationship between Human Factors and incidents/accidents attributable to aircraft maintenance activities. It will examine how three areas of Human Factors, Social Psychology, Communication and Human Error are central to the safety of aircraft operations / maintenance and how important it is to educate all personnel in aviation of the benefits of this awareness in minimizing error, incidents and accidents and increasing safety, efficiency and personal well-being. It is the interaction of maintenance personnel, the equipment they use, the written and verbal procedures and rules they follow and the environmental conditions of any system in the aircraft maintenance field.

"Human factors" refers to the study of human capabilities and limitations in the workplace. Human factors researchers study system performance. That is, they study the interaction of maintenance personnel, the equipment they use, the written and verbal procedures and rules they follow, and the environmental conditions of any system. The aim of human factors is to optimise the relationship between maintenance personnel and systems with a view to improving safety, efficiency and personal well-being.

Human Factors also relates to the principles which apply to Aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration of human performance. 'Human performance' means human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Social Psychology: There are six major areas which social psychology addresses as key elements and they are:

- Responsibility: individual and group;
- Motivation and de-motivation;
- Peer pressure;
- "Culture" issues;

- Team Working;
- Management, supervision and leadership.

This section will draw together issues relating to the social context in which the aircraft maintenance engineer works. It includes the organisation in which one works and how responsibilities may be delegated, motivation and aspects of team-working, supervision and leadership.

Communication: Communication can be formal or informal. Efficient verbal communication between cockpit crew members has received a lot of attention over the last 20 years, as airlines, regulators and airframe manufacturers have developed and improved crew resource management (CRM) programs. Good verbal communication between crews and air and ground controllers is important for safety. Because of this a formal structure with restricted vocabulary is used to be sure that messages are clearly understood. Several recent aviation accidents have been attributed to not using this form of verbal communication:

- Within and Between Teams;
- Work Logging and Recording;
- Keeping up to date / Currency of training, education;
- Dissemination of Information.

Good communication is important in every industry, in aircraft maintenance engineering, it is vital. Communication or more frequently, a breakdown in communication is often cited as a contributor to aviation incidents and accidents. This section will address the various aspects that affect the aircraft maintenance engineer.

Communication skills are particularly important in the aircraft maintenance environment. Mechanics, team leaders and inspectors must all have the knowledge and skills to communicate effectively. Poor communication can have any or all of the following consequences:

- The quality of work and performance might be reduced;
- Time and money may be lost as errors occur because important information is not communicated or messages are not understood correctly;
- Poor communication may cause frustration and high levels of stress.

Human Error: Human error played a big role in most of the well-known disasters in the world, such as Bhopal, the Exxon Valdez, and Chernobyl. As in any complex technical activity, human error is also involved in the majority of aviation maintenance-related incidents and accidents.

Estimates of this human error rate have increased over the years, from a low of around 20% in the 1960s to over 80% in the 1990s. Does this mean that people now do not care, forget, do not pay attention and do not consider the consequences? Not really, but it does reflect two important and wide spread trends.

Aircraft components, along with most other items of equipment, have become both more sophisticated and more reliable over the past thirty years. There is a growing realisation that designers, manufacturers, executives, and maintenance managers can make mistakes which result in conditions which cause more errors on the hangar floor.

These two trends have resulted in fewer and fewer component-related failures but in more reports of human errors. Areas which will be addressed cover:

- Error Models and Theories;
- Types of Error in Maintenance Tasks;
- The Dirty Dozen;
- Possible Results of Errors;
- Avoiding and Managing Errors.

In communicating, there is a “transmitter” who sends a signal, a message or a meaning to a “receiver”. In order to have communication, both the transmitter and the receiver must share a common code, so that the meaning or information contained in the message may be interpreted without error.

Human errors were recognized as a major hazard to safe flight operations at least as early as World War II. Most of the work in aviation research has been focused on operational errors made by flight crews and air traffic controllers. This is right, as the majority of serious aviation accidents are the result of operational errors.

However, as everyone working in aviation maintenance knows, there have been a number of serious, even fatal, accidents over the years that were mainly caused by maintenance errors. Public and official awareness of maintenance errors increased dramatically after the Aloha Airlines B737 accident in 1988.

Thankfully, due to modern design and manufacturing, aircraft are becoming more and more reliable. However, it is not possible to re-design the human being. We have to accept the fact that the human being is intrinsically unreliable. With proper Human Factors education we can work around that unreliability by providing good training, procedures, tools, duplicate inspections etc.

References

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